

NEW OR IMPERFECTLY KNOWN SPECIES OF EARTHWORMS. NO. 1.

By **SEITARO GOTO**, Professor, and **SHINKICHI HATAI**, Assistant.
First High School Tokyo.

In this series of papers we purpose to describe new or imperfectly known species of earthworms collected from various parts of the Japanese Empire; and at the outset we wish to state clearly the respective part which each of us has taken in the work. For the practical portion of the work as well as the determination of new species the credit is entirely due to the junior writer (H), while for a general supervision of the work and the form in which the results are presented the senior writer is alone responsible. The species will be described without any definite order, as their study is completed. In the present paper we have put together only the species of the genus *Perichaeta* that have come into our hands.

The following characters, which are, unless otherwise stated, common to all, have been omitted in the following descriptions: (1) Gizzard in VIII—IX; (2) ovaries in XIII, oviduct pore in XIV; (3) spermduct pores in XVIII.

1. ♀ *Perichaeta Sieboldii*, Horst.

We mention this species, the oldest known to science from Japan, with a query, because, strange to say, we have not yet come across any specimen exactly answering to its descriptions given by European writers. They all agree in stating that the spermathecae are situated in VI/VII, VII/VIII, and VIII/IX, and the number of setae between the male genital pores are given as 13,* while for the spermathecal region it is given as 76 by Rosa and 80 by Horst.† Now the numerous specimens which we regard as belonging to *P. Sieboldii* all present this difference that, the spermathecae lie in V/VI,

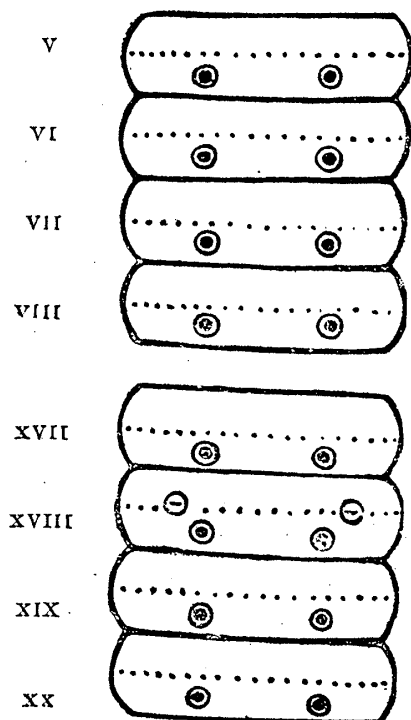
* Rosa, D.—Die exotischen Terricolen des K. K. naturhistorischen Hofmuseums (Wien), 1891, p. 401; "Die männlichen Geschlechtsöffnungen am 18. Segment liegen in der 14. Borstenlinie."

† We have not been able to gain access to Horst's original description, and have therefore relied on references by later writers.

VI/VII, and VII/VIII, therefore one segment anteriorly than is stated to be the case by previous writers, while the number of setæ lying between the male pores we have observed to be 14-19, and the same in the spermathecal region to be about 60. The last two points cannot, in our opinion, be regarded as of much systematic importance, as we have learnt from our experience, that they are rather frequently subject to variation. It must sound presumptuous in us to suppose that all the previous observers have fallen into the same error; but it must at the same time be admitted as a strange circumstance that we have never met with any specimen answering to the description of previous writers, although we have made a rather extensive collection in the same locality whence the specimens of the European writers are known to have come or have presumably been collected. On the contrary there have come under our observation at least more than two hundred specimens differing from *P. Sieboldii* in a single character of systematic importance, viz. the position of the spermathecae mentioned above. These worms are very common in this part throughout the warmer months of the year, and they are widely distributed, since we have specimens also from Sendai, Shizuoka, and Tsugaru. They are therefore the most likely to be represented in any chance collection of earthworms from this part of Japan; and we know that *P. Sieboldii* is represented in all the European collections of earthworms made in Japan, of which we have record (Leyden, Vienna, Oxford, Berlin). It would be preposterous to suppose that all the specimens in Europe presented precisely the same variation. We therefore await the result of a renewed examination on the part of European students.

2. *Perichceta fusca*, n. sp.

Length of body 150 mm., breadth 5 mm.; number of segments 110; dusky colored on the back, lighter colored on the ventrum. Clitellum XIV—XVI, without setæ. Towards the two extremities of the body the boundary lines between the segments are very distinct and the setæ are longer; number of setæ smaller in the anterior segments, being 24-25 in the spermathecal segments and about 35 in the more posterior segments. First dorsal pore XIII/XIV; spermathecal openings four pairs, V/VI, VI/VII, VII/VIII, VIII/IX; V, VI, VII, VIII with a pair of genital papillæ behind the chaetal-line; oviduct pore single; male openings on the top of papillæ; XVII, XVIII, XIX, XX with a pair of genital papillæ situated inside the line of the male pores and behind the



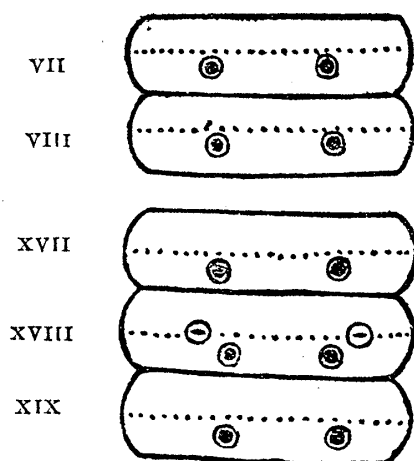
heart in XIII.

Loc.—Kamakura.

chaetal line; male pores separated by 9 setae.

Intestine begins in XV; *intestinal caeca* one pair in XXVII; thickened septa V/VI—VII/VIII in front of the gizzard, and X/XI—XIII/XIV behind it, septum IX/X very thin and transparent, septum VIII/IX ab.ent. Spermathecae four pairs, in VI, VII, VIII, IX, with diverticula longer than the sac and enlarged at the blind end. Testes in X, XI; sperm reservoir in XI, XII; ovary small, close to the ventral body wall. Ovisacs (*receptaculum ovarum*) two pairs, in XIII, XIV, with the proximal portion attached to the septa between these segments and the next preceding. Prostate gland small, and only slightly lobulated. Last

3. *P. campestris*, n. sp.



single. Sperm duct openings on papillae, separated by 7 setae; XVII, XVIII, XIX with a pair of genital papillae behind the chaetal line.

Intestine begins in XV; *intestinal caeca* one pair, in XXVI, large, extend-

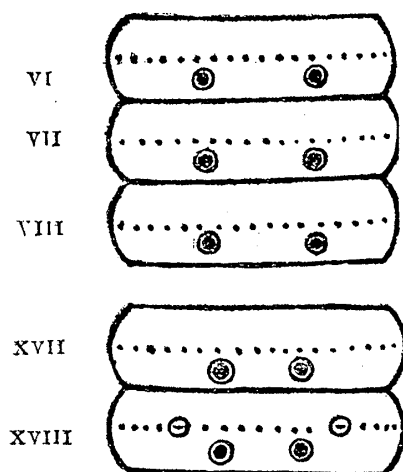
Length of body 120 mm., breadth 6 mm., number of segments 77. Clitellum XIV—XVI, without setae. Number of setae in the spermathecal segments 35, but in XVIII there are 47; generally speaking there are fewer setae in the more anterior segments. First dorsal pore XIII/XIV. Spermathecal pores two pairs in VII/VIII, VIII/IX; VII, VIII with a pair of genital papillae lying close to the spermathecal pores and behind the chaetal line. Oviduct pore

ing for 4 segments anteriorly, and with the anterior end usually winding. Thickened septa V/VI—VII/VIII in front of the gizzard, and X/XI—XIII/XIV behind it; septa VIII/IX, IX/X wanting. Spermathecae two pairs, in VIII, IX, with small diverticula, blind end enlarged. Testes in X, XI; sperm reservoirs in XI, XII. Ovisacs two pairs in XIII, XIV, small. Prostate gland lobate, occupying XVII—XX. Last heart in XIII.

Loc.—Kamakura.

4. *P. kamakurensis*, n. sp.

Length of body 120 mm., breadth 6 mm., number of segments 79. Clitel-



lum XIV—XVI, without setae. Number of setae in the spermathecal segments about 33. First dorsal pore XII/XIII. Spermathecal pores three pairs in V/VI, VI/VII, VII/VIII; VI, VII, VIII with a pair of genital papillae behind the chætal line. Oviduct pore single. Sperm ducts opening on papillae, the pores being separated by 10 setae; one pair of genital papillae on the same and the preceding segments behind the chætal line and inside the male pores.

Intestine begins in XIV; one pair of intestinal caeca in XXVII, extending for three segments anteriorly. Thickened septa V/VI—VII/VIII and X/XI—XII/XIII; no septa in VIII/IX, IX/X. Spermathecae three pairs, in VI, VII, VIII, with diverticula. Testes in X, XI; sperm reservoirs in XI, XII, with the dorsal surface lobed. Ovary small; ovisacs in XIII. Prostate gland somewhat rectangular, with shallow furrows on the surface, small, extending through XVII, XVIII; sperm duct without any terminal bulb. Last heart in XIII.

Loc.—Kamakura, Tokyo.

5. *P. parvula*, n. sp.

Length 32 mm., breadth 2 mm., number of segments 48. Clitellum XIV—XVI, without setae. First dorsal pore XI/XII. Spermathecal pores three pairs, in V/VI, VI/VII, VII/VIII; no genital papilla in this region. Sperm

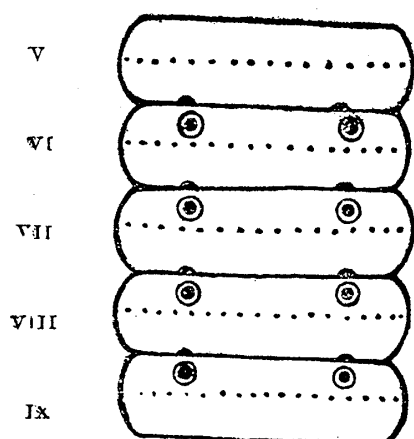
duct pores could not be observed; no genital papilla around them. Color of alcoholic specimens dusky.

Intestine begins in XVI; one pair of intestinal cœca in XXVIII, elongated, extending through four segments anteriorly. Thickened septa V/VI—VII/VIII and X/XI—XV/XVI; septa VIII/IX, IX/X wanting. Spermathecae three pairs, in VI, VII, VIII, without diverticula. Testes in X, XI; sperm reservoirs in XI, XII. Ovary comparatively large; ovisac absent. Prostate gland wanting. Last heart in XIII.

Loc.—Kamakura.

6. *P. heteropoda*, n. sp.

Length 100 mm., breadth 4 mm., number of segments 72; all the segments



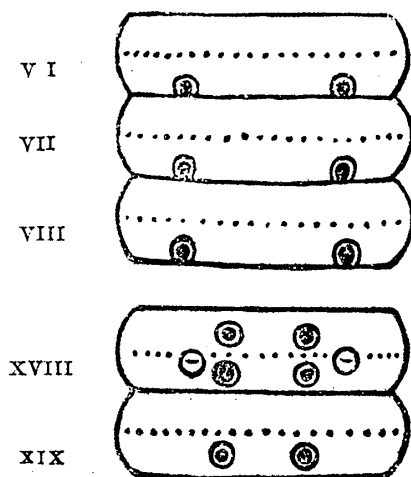
except the first and the last of the same breadth. Color brown, except the clitellum, which is yellowish. Clitellum XIV—XVI, without setae. *Setae of segments II—XIII thicker and longer*; their number in the spermathecal segments 32. First dorsal pore X/XI. Spermathecal pores four pairs, in V/VI, VI/VII, VII/VIII, VIII/IX; VI, VII, VIII, IX, with a pair of genital papillae in front of the chaetal line. Sperm duct pores separated

by 12 setae; no genital papillae in this region; margin of the pores slightly elevated.

Intestine begins in XVII; one pair of intestinal cœca in XXVI, extending for three segments anteriorly. Thickened septa V/VI—VII/VIII and X/XI—XV/XVI; septa VIII/IX, IX/X wanting. Spermathecae 4 pairs, in VI, VII, VIII, IX, with diverticula which are not convoluted but with the blind end simply enlarged. Testes in X, XI; sperm reservoirs in XI, XII. Ovary large; ovisac absent; oviduct also large and very easy to observe. The two vasa efferentia unite near the septum XII/X II; *prostate gland absent; terminal bulb present*, situated a little in front of the external male pore. Last heart in XIII.

Loc.—Tokyo, Tokorosawa (about 20 miles N.W. from Tokyo), Kamakura.

7. *P. obscura*, n. sp.



Length 80 mm., breadth 4 mm., number of segments 76. Clitellum XIV—XVI, without setae, not glandular and with the same appearance as the other segments; each clitellar segment with a transverse granulate ridge on the ventral side. Number of setae in the spermathecal segments 35—38. First dorsal pore X/XI. Spermathecal pores 3 pairs, in VI/VII, VII/VIII, VIII/IX, on top of papillae directly in front of the intersegmental line.* Sperm duct pores separated by 14 setae; segment XVIII with two pairs of genital papillae, one in front of chætal line and the other behind it; segment XIX with one pair of similar papillae behind the chætal line.

Intestine begins in XV; one pair of intestinal caeca in XXVI, very small, extending for 2 segments anteriorly. Thickened septa V/VI—VI/VIII and X/XI—XIV/XV; septa VIII/IX, IX/X wanting. Spermathecae 3 pairs, in VII, VIII, IX, with diverticula, finger shaped and straight. Testes in X, XI; sperm reservoirs in XI, XII. No ovisac. Prostate gland small, extending through only 2 segments, lobed, rectangular; no terminal bulb on the sperm duct. Last heart in XIII.

Loc.—Kamakura.

8. *P. scholastica*, n. sp.

Length 155 mm., breadth 5 mm., number of segments 127. Clitellum XIV—XVI, without setae. Number of setae in the spermathecal segments 39—48, posterior to IX 48 in each; in preclitellar segments the ventral setae are larger than the dorsal, but in postclitellar segments they are all of the same size; in the nine segments immediately in front of the clitellum as well as in

* In the upper portion of the accompanying cut the spermathecal openings have by oversight been represented like genital papillae.

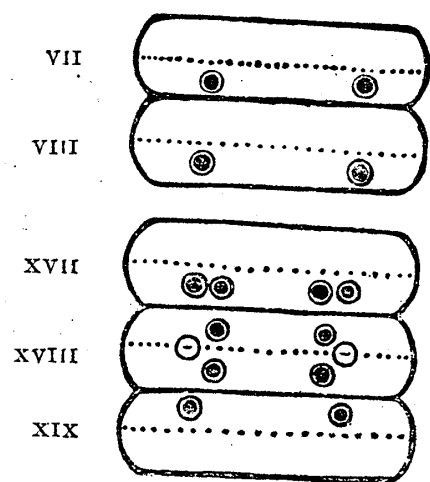
6—7 segments immediately behind it the chaetal lines are more prominent and the intersegmental lines more distinct. Color of clitellum in alcoholic specimens brown, the rest grey. Spermathecal pores 4 pairs, in IV/V, V/VI, VI/VII, VII/VIII; no genital papillae in this region. Sperm duct pores separated by 8 setae; genital papillae wanting.

Intestine begins in XV; one pair of intestinal caeca in XXV, extending forwards as far as XXIII. Thickened septa VI/VII, VII/VIII and X/XI—XIV/XV; septa V/V', VIII/IX, IX/X absent. Spermathecae 4 pairs, in V, VI, VII, VIII. In the single specimen of this species that has come under our observation only the spermatheca on the left side of VII was provided with a minute diverticulum; which is probably a departure from the rule. Testes in X, XI; sperm reservoirs in XI, XII. Ovisacs two pairs, in XIII, XIV, very small. Prostate gland large, 2-lobed, *directly opening into the sperm duct without the mediation of a duct*. Last heart in XIII.

Loc.—Tokyo.

9. *P. decimpapillata*, n. sp.

Length 150 mm., breadth 4 mm., number of segments 115, of uniform breadth throughout. Clitellum XIV—XVI, without setae. Number of setae in the spermathecal segments 36. First dorsal pore XI/XII. Spermathecal



pores 3 pairs, in V/VI, VI/VII, VII/VIII; VII, VIII with a pair of genital papillae behind the chaetal line. Sperm duct pores on papillae, separated by 10 setae; five pairs of genital papillae in the vicinity, two pairs in XVII behind the chaetal line, two pairs in XVIII inside the male pores, one in front of, and the other behind, chaetal line, and one pair in XIX in front of the chaetal line, these in XVIII being in a line with the inner pair of the preceding segment.

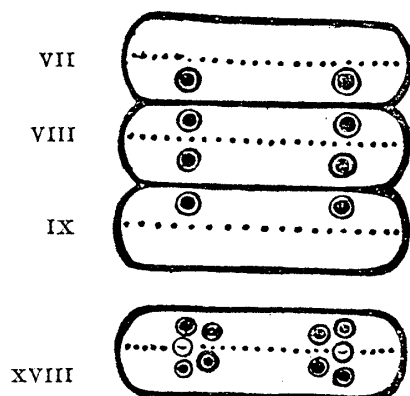
Intestine begins in XV; one pair of intestinal caeca in XXVI, extending for three segments anteriorly. Thickened septa V/VI—VII/VIII and X/XI—XIII/XIV; septa VIII/IX, IX/X absent. Spermatheca 3 pairs, in VI, VII, VIII, *with very small diverticula*.

Testes in X, XI; sperm reservoirs in XI, XII. Ovisacs one pair, in XIII. Prostate gland large, extending through 5 segments, XVI—XX, lobate. No terminal bulb on the sperm duct.

Loc.—Tokyo.

10. *P. flavescens*, n. sp.

Length 120 mm., breadth 6 mm., number of segments 126. Clitellum XIV—XVI, swollen, without setæ. Anal segment comparatively long. Number of setæ in the spermathecal segments constant, viz. 20; these as well



as the anterior segments with larger but fewer setæ than the posterior segments, which are provided with more but smaller setæ, there being 40—50 in each. First dorsal pore in XIII/XIV. Spermathecal pores 3 pairs, in VI/VII, VI—I/VIII, VIII/IX; VII with one pair of genital papillæ behind the chætal line, VIII with two pairs, one in front of, and the other behind, the chætal line, IX with one pair in front of the chætal line; there

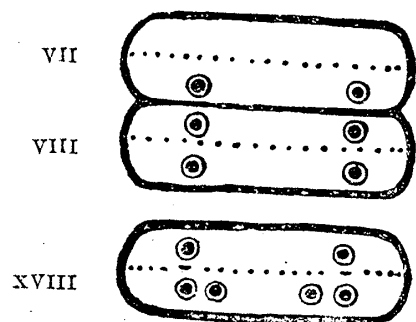
being 4 pairs in all in this region. Sperm duct pores on top of papillæ, separated by 7 setæ; 4 pairs of genital papillæ in XVIII, two external and two internal; the internal pairs lying inside the male pores, close to the chætal line, one in front of, and the other behind it; the external pairs are also situated in front and behind, but lie slightly external to the male pores; the papillæ around each male pore occupying the four corners of a trapezoid with the parallel sides parallel to the long axis of the worm and the shorter side turned inward.

Intestine begins in XV; one pair of intestinal cœca in XXV, extending for three segments anteriorly. Thickened septa IV/V—VII/VIII and X/XI—XII/XIII; septa VIII/IX, IX/X wanting. Spermathecæ 3 pairs, in VII, VIII, IX, with large vesicular portions and short ducts; only the pair in VIII with minute diverticula. Testes in X, XI; sperm reservoirs in XI, XII. Ovisacs in XIII. Prostate gland large, occupying XVII—XIX, 2-lobed,

with shallow furrows on the surface. No terminal sac on the sperm duct. Last heart in XIII.

Loc.—Tokyo.

11. *P. producta*, n. sp.



Length 140 mm., breadth 6 mm., number of segments 120. Clitellum XIV—XVI, without setæ. Number of setæ in VI 30, in VII 35, in VIII 39, in IX 31, in the more posterior segments 40—45; preclitellar setæ large. First dorsal pore in XIII/XIV. Spermathecal pores 3 pairs, in VI/VII, VII/VIII, VIII/IX; genital papillæ three pairs, one pair in

VII behind the chætal line, two pairs in VIII, one in front of, the other behind, the chætal line. Sperm duct pores slit-shaped and not opening on papillæ, therefore difficult to make out, separated by 8 setæ; genital papillæ 3 pairs in XVIII, one pair in front of the chætal line, in a line with the male pores, and two pairs, internal and external, behind the chætal line, the external pair being in a line with the male pores.

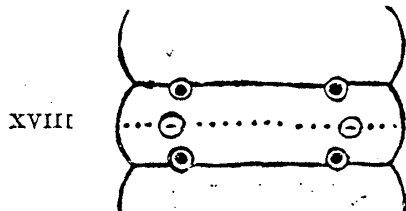
Intestine begins in XV; one pair of intestinal cæca in XXV, extending for three segments anteriorly. Thickened septa V/VI—VII/VIII and X/XI—XIII/XIV; septa VIII/IX, IX/X absent. Spermathecae 3 pairs, in VII, VIII, IX, with large vesicular portions and short ducts, without diverticula. Testes in X, XI; sperm reservoirs in XI, XII. Ovaries comparatively large; ovisacs small, in XIII, XIV. Prostate gland wanting; no terminal bulb on the sperm duct. Last heart in XIII.

Loc.—Tokyo.

As cases of variation occurring in this species we may mention four specimens which differed from the above in the following respects: (1) clitellar segments with about 40 setæ, (2) number of setæ in the spermathecal segments 45, in III 30, in XX 48, (3) setæ small and of uniform size everywhere, (4) sperm duct pores on top of papillæ, and separated by 10 setæ. We think that these differences are hardly entitled to specific distinction.

12. *P. micronaria*, n. sp.

Length 66 mm., breadth 3 mm., number of segments 106. Clitellum



XIV—XVI, without setæ. Number of setæ in the spermathecal segments 28-32, more posteriorly 35. First dorsal pore in XI/XII. Spermathecal pores 4 pairs in V/VI—VIII/IX; *no genital papillæ in this region*. Sperm duct pores large, on top of papillæ, separated by 8 setæ; two pairs of genital

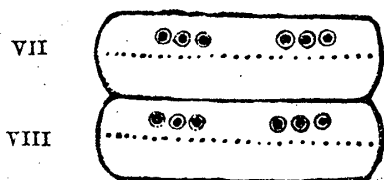
papillæ in XVIII just inside the lines of the male pores, each pair close to the intersegmental lines.

Intestine begins in XV; one pair of intestinal cœca in XXVI, extending for two segments anteriorly. Thickened septa V/VI—VII/VIII and X/XI—XII/XIII. Spermathecae 4 pairs, in VI—IX; only the pair in VIII with minute diverticula. *No ovisac*. Prostate gland in XVII—XX. Testes in X, XI; sperm reservoirs in XI, XII, comparatively small. Last heart in XIII.

Loc.—Tokyo.

13. *P. vittata*, n. sp.

Length 100 mm., breadth 6 mm., number of segments 68. In the dorsal



aspect, the chætal lines are light grey and the rest dark brown, thus appearing banded; in the ventral view of uniform light grey. Clitellum flesh-red, XIV—XVI, without setæ. Number of setæ in III 35, in VII 57, in VIII 59, in XVIII 60. First dorsal pore

in XIII/XIV. Spermathecal pores 6 pairs, on top of papillæ, 3 pairs in both VII and VIII, those of the same segment being situated in the same transverse line and in front of the chætal line.* Sperm duct pores could not be detected externally.

Intestine begins in XVI; one pair of intestinal cœca in XXVI, with five secondary cœca, of which the most dorsal is longest and the more ventral ones gra-

* The punctated circles in the accompanying cut represent the spermathecal openings and not genital papillæ, as might be inferred from analogy with other cuts.

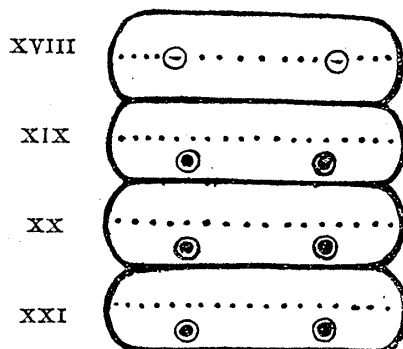
dually become shorter. Thickened septa V/VI—VII/VIII and X/XI—XV/XVI. Spermathecae 6 pairs, three in VII and three in VIII, without diverticula. Testes in X, XI; sperm reservoirs in XI, XII, very small, only the dorsal edges projecting on either side of the intestine. Ovaries as well as ovisacs comparatively large, in XIII. The two vasa efferentia unite in XII; the vas deferens can be traced sometimes as far back as XVIII or more backwards, the extremity being usually club-shaped. Last heart in XIII.

Loc.—Tokyo, Kamakura.

Among the numerous specimens of this species that have come under our observation two presented the following points of variation: (1) first dorsal pore in XII/XIII, (2) spermathecae only in VIII, and the pores neither on top of papillae nor in the segment but in the intersegmental line between VII and VIII.

14. *P. grossa*, n. sp.

Length 240 mm., breadth 8 mm., number of segments 141. Near the two ends of the body the chaetal lines are more prominent and the intersegmental lines



more distinct. Clitellum XIV—XVI, without setae. Number of setae in the spermathecal segments 53-57, in the more posterior segments 60-70. First dorsal pore in XIII/XIV. Spermathecal pores 4 pairs, in V/VI—VIII/IX; no genital papillae around them. Sperm duct pores on top of papillae, separated by 9 setae; XIX, XX, XXI each with a pair of genital papillae behind the chaetal line.

Intestine begins in XV; one pair of intestinal caeca in XXVI, very long, extending for 6 segments anteriorly. Thickened septa V/VI—VII/VIII and X/XI—XIV/XV; septa VIII/IX, IX/X wanting. Spermathecae 4 pairs, in VI, VII, VIII, IX, with tubular, convoluted diverticula longer than the pouches. Testes in X, XI; sperm reservoirs in XI, XII; both testes and the reservoirs large. Ovary large; no ovisac. Prostate gland lobate, in XV—XIX. Last heart in XIII.

Loc.—Kawaguchi (Prov. Kai).

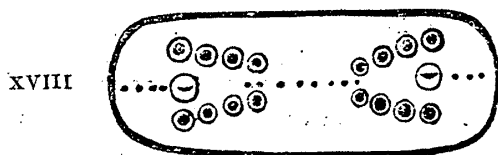
15. *P. schizopora*, n. sp.

Length 78 mm., breadth 4 mm., number of segments 96. Clitellum XIV—XVI, without setæ, but with distinct intersegmental lines and with the same color as the rest of the body. Setæ fewer in the anterior segments, 33 in III, 44 in IV, 53 in V, and thereabout in the more posterior segments. First dorsal pore in XII/XIII. Spermathecal pores one pair, in VII/VIII, distinct and slit like, with a slightly elevated margin. Oviduct pores one pair, the two being separated by about 1 mm. Sperm duct pores could not be observed. No genital papilla anywhere.



Intestine begins in XV; 5 pairs of intestinal cœca in XXVI, the most dorsal pair being longest, and thence decreasing towards the ventrum. Thickened septa V/VI—VI/VII and X/XI—XIV/XV; in VII/VIII there are a few oblique muscles but no distinct septum; septa VIII/IX, IX/X absent. Spermathecae one pair, in VIII. In the single specimen observed, the spermatheca of the left side had *three diverticula*, two of which were shorter than the pouch and had vesicular extremities, while the third was long and finger-shaped; the spermatheca of the right side had only one finger-shaped diverticulum; that of the left side probably represents the normal condition. Tests in X, XI; sperm reservoirs in XI, XII, very small. Ovisacs in XIII. No special feature about the oviducts except that *they are entirely separate*. No prostate gland; the sperm duct can be traced only as far as XIV. Last heart in XIII.

Loc.—Tokyo.

16. *P. Takatorii*, n. sp.*

Length 314 mm., breadth 8 mm., number of segments 120. Ventral and dorsal sides very different in color, the former being yellowish

brown and the latter light grey. Clitellum XIV—XVI, without setæ, of

* Dedicated to Mr. Y. Takatori of the Agricultural Department of the Government of Formosa, whose kindness in complying with our request to collect and send earthworms is here gratefully acknowledged. We owe this as well as the next following species to him.

uniform light yellow. Number of setae fewer in the anterior segments; in the spermathecal segments 51, behind them about 65. First dorsal pore in XI/XII. Spermathecal pores two pairs, in VII/VIII, VIII/IX; with two or three genital papillae on the posterior margin of the next preceding segment. Sperm duct pores on top of papillae, each surrounded by 8 genital papillae arranged by fours on the two sides of an isosceles triangle with the base turned externally.

Intestine begins in XV; one pair of intestinal caeca in XXVI, extending for 3 segments anteriorly. Thickened septa V/VI—VII/VIII and X/XI—XIII/XIV; septa VIII/IX, IX/X wanting. One pair of spermathecae in VIII, with two finger-shaped, more or less winding diverticula of unequal lengths, and another pair of similar spermathecae and three pairs of small accessory spermathecae without diverticula in IX; the accessory spermathecae being situated internally to the well-developed ones. Testes in X, XI; sperm reservoirs in XI, XII. Ovisacs in XIII. Prostate glands lobate, in XVII—XXI. Last heart in XIII.

Loc.—Taipei-fu (Northern Formosa).

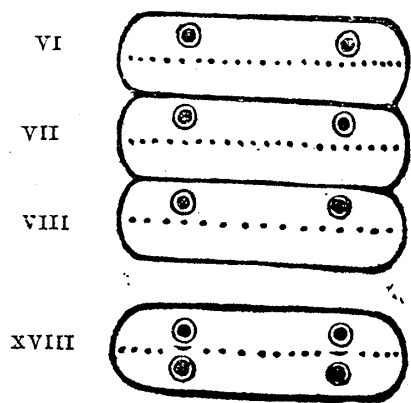
17. *P. candida*, n. sp.

Length 150 mm, breadth 6 mm., number of segments 95. Color dark brown on the dorsal side, light grey on the ventral side, and the two colors meeting in a

line on the lateral side; with metallic lustre; chaetal lines faintly white. Clitellum XIV—XVI, without setae. Setae somewhat widely separated from each other; in II there were 20 setae, in III 32, in IV 34, in VII 44, in VIII 46, in XVIII 44. First dorsal pore in XIII/XIV. Spermathecal pores two pairs, in VI/VII, VII/VIII; one pair of genital papillae in front of the chaetal line in VI, VII, VIII. Sperm duct pores separated by

12 setae; two pairs of genital papillae directly inside the male pores, one on either side of the chaetal line.

Gizzard in IX—X; intestine begins in XV; one pair of intestinal caeca in XXVII, extending for two segments anteriorly. Thickened septa VI/VII—



VIII/IX and X/XI—XIII/XIV; septa IX/X, X/XI wanting. Spermathecae two pairs, in VII, VIII, with diverticula more than 3 times as long as the pouches. Testes in X, XI; sperm reservoirs in XI, XII. No ovisac. Prostate gland large, lobate, in XVII—XXII; terminal portion of the sperm duct S-shaped. Last heart in XIII.

Loc.—Taipei-fu (Northern Formosa).

The principal characters of the species here described are summarised in the adjoined table.

Printed September 30th, 1898.
